

Work Assignment No. 4-27
Performance Work Statement

1. Title: Site Monitoring of EPA-Designated Ocean Disposal Sites in Region 9: South Oahu and Hilo Sites

2. Work Assignment Manager (WAM):

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3. Period of Performance: The period of performance for this work assignment (WA) shall be from issuance date by the Contract Officer to February 28, 2014.

4. Background:

Ocean disposal sites are designated by the Environmental Protection Agency (EPA) to minimize cumulative environmental effects of disposal to the area or region in which the site is located. Many of these ocean disposal sites are located offshore of major ports, harbors, and marinas nationwide and are very important for maintaining safe navigation for commercial, military, and private vessels. Disposal operations must be conducted in a manner that allows each site to operate without adverse impacts to the coastal marine environment in excess of what is expected under the given site use requirements.

These site use requirements are based on site designation parameters established in the National Environmental Policy Act (NEPA) documentation [i.e., environmental impact statement (EIS) or environment assessment (EA)] and site management and monitoring plan (SMMP) for each ocean disposal site. To date, there are 12 permanent EPA sites in Region 9. Each SMMP typically incorporates a tiered monitoring structure to address potential environmental issues specific for each site and the geographic area in which it is located. Site monitoring activities include, but are not limited to: sediment sampling and analyses for chemical content and concentrations; sediment profile imaging; sediment sampling for benthic community analyses; and geophysical surveys to determine wide area distribution of native sea bed features and deposits of dredged material disposed at EPA-designated ocean dredged material disposal sites (ODMDS).

EPA has responsibility for site monitoring in accordance with requirements specified at 40 CFR 228.13. This WA request identifies survey- and site monitoring-related activities that would be implemented in accordance with an EPA survey plan to be developed for two EPA-designated ocean disposal sites located in the Hawaiian Islands, South Oahu and Hilo, intended to fulfill requirements specified by the SMMPs.

5. General Description of Monitoring Activities and Surveys:

Under this work assignment, the Contractor shall perform a number of site monitoring tasks at the South Oahu and Hilo sites, within a scope of activities over a limited number of field survey days (maximum of 8 ship days, including weather days). The total number of sample station locations for the two sites shall not be greater than 120 locations. For each station location, a maximum of three types of samples will be collected, per services described below (see 1 through 3 below). There is an estimated 55 nautical miles of transect line associated with the sub-bottom profiling and multi-beam surveys (see 4 through 5 below). Should the Contractor need to propose some functionally equivalent work process or equipment, such change will need to be approved by written technical direction by the WAM, with a formal amendment approved and issued by Contracting Officer.

The technical support services shall include one day of pre-survey, maximum of 8 ship days and one day of post-survey support. The expectation is that field operations will be conducted continuously around the clock (24/7) while at sea, including two 12-hour shifts.

The Contractor shall provide the following services:

(1) sediment profile imaging (vertical axis high resolution photographic profile of the seabed sediment, including any stratification with depth – minimum sampling requirements: prism set up for 20 centimeters target penetration; approximate image area of 20 centimeters depth by 15 centimeters width) and plan view imaging (horizontal axis high resolution photography of surface features for the area of sampling – minimum sampling requirements: domed glass port to eliminate edge distortion; laser beam horizontal axis scaling; approximate photographic areas ranging from less than 1 square meter to 10 square meter, depending on visibility and features of interest); this survey task should be conducted after completion of multi-beam survey (if available) and before sediment sampling tasks (see Attachment #1);

(2) sediment sampling and analyses for chemical content and concentrations (depth capability of at least 550 meters – minimum sampling requirements: target penetration of 20 centimeters; double Van Veen sediment sampler, or equivalent, to facilitate simultaneous collection of chemistry and benthic samples (chemistry list provided in Attachment #1);

(3) sediment sampling for benthic community analyses (depth capability of at least 550 meters – minimum sampling requirements: target penetration of 20 centimeters; double Van Veen sediment sampler, or equivalent, to facilitate simultaneous collection of chemistry and benthic samples (benthic analysis requirements in Attachment #2); and

(4) sub-bottom geophysical surveys (CHIRP or equivalent) to determine (horizontal scale; resolution on the order of 5 meters) area distribution of deposits of dredged material disposed at EPA-designated ocean dredged material disposal sites (ODMDS) relative to native sea bed features – this survey is expected to be conducted on a separate, specially-equipped vessel; timing of this survey is independent of survey work aboard the NOAA vessel (see Attachment #3 - example grid map and other specifications)

(5) multi-beam surveys to identify any special or unexpected features on the seabed that may influence actual locations of sampling stations; this survey should be conducted as the initial task at each site before any other sampling occurs; however, use of this will be subject to

availability of NOAA equipment (this hull-mounted equipment currently is not functional and in need of software upgrade); post-processing of this data can be done in conjunction with associated sediment grain size analysis to construct sediment maps for each site; Contractor shall ensure that this system is calibrated and adjusted appropriately for purposes of post-processing; Contractor may be required to be on board for the duration of overall survey (see Attachment #3)

Prior to the surveys, other specific monitoring activities may be added as appropriate, and adjustments in the number of sampling stations may occur. Any such changes would need to be done by formal agreement that is signed and issued by the Contracting Officer. Each site monitoring survey may include the following:

- 1) fieldwork support to collect the necessary data and/or samples;
- 2) management and maintenance of field survey equipment;
- 3) analysis of collected data and/or samples; and
- 4) data management which includes QA/QC review of all data and preparation of data files in appropriate EPA electronic (digital) format, which may include but not limited to: Microsoft Office, Extensible Markup Language (XML), Comma-Delimited format (CSV), Extended Triton format (XTF), Portable Document Format (PDF), Joint Photographic Experts Group (JPEG), and Geographic Information Systems (GIS)-compatible formats.

The South Oahu site is located approximately 3 nautical miles offshore of Pearl Harbor in water depths not exceeding 550 meters. It is a rectangular ocean disposal site 2 kilometers wide and 2.6 kilometers long, with center coordinates of 21 degrees 15.167 minutes North Latitude, 157 degrees 56.833 minutes West Longitude, and occupies an area of about 5.2 square kilometers. Monitoring for this site would include multi-beam survey (if NOAA system is available and functional), sediment profile imaging and plan view imaging of the seabed, sediment sampling and analyses for chemical content and concentrations, sediment sampling for benthic community analyses, and sub-bottom geophysical survey.

The Hilo site is located approximately 4 nautical miles offshore of Hilo in water depths not exceeding 400 meters. It is a circular ocean disposal site with a radius of 920 meters, with center coordinates of 19 degrees 48.500 minutes North Latitude, 154 degrees 58.500 minutes West Longitude, and occupies an area of about 2.7 square kilometers. Monitoring for this site would include multi-beam survey (if NOAA system is available and functional), sediment profile imaging and plan view imaging of the seabed, sediment sampling and analyses for chemical content and concentrations, and sediment sampling for benthic community analyses. Note that the sub-bottom geophysical survey for this site will be an option.

6. Description of Tasks:

Task 1: Project Management

The Contractor shall prepare a work plan within 21 calendar days of receipt of WA. The work plan shall present the technical approach by task; the project schedule and deliverables; staffing details; level of effort by task, staff member, and professional labor mix; and the estimated budget. Included in the work plan, the Contractor shall prepare a Quality Assurance Project Plan (QAPP).

The WAM will approve the QAPP prior to initiation of sample collection and analysis. Under this work assignment, the requested work including field monitoring support, data analysis and report writing shall be conducted in accordance with the approved QAPP and work plan. The QAPP for the Sediment profile imaging (SPI) analysis and other survey analytical tasks must provide sufficient detail to demonstrate the following:

- the project technical and quality objectives (e.g., Data Quality Objectives) are identified;
- the intended measurements or data acquisition methods are appropriate for achieving project objectives;
- assessment procedures are sufficient for confirming that data of the type and quality needed and expected are obtained; and
- any limitation on the use of the data can be identified and documented.

The Contractor shall provide electronic copies of the monthly progress reports to the EPA Project Officer (PO) and WAM. Each progress report shall describe the technical work and expenditures for the same time period as the corresponding invoice. The reports shall list by task the amount of work completed and include a table of hours by personnel for each task. The reports also shall identify any problems or difficulties. Quarterly, the reports shall include a QA section that summarizes QA steps taken in the performance of work during the reporting period.

The Contractor shall submit an email that proposes a standardized naming convention and version control for all deliverables associated with the WA. This system will ensure that deliverables are clearly named and dated and that the sequence of versions of a document is clear. The EPA WAM will review the email and then provide the contractor with written notification of approval or edits that need to be made. After receiving notification of approval the contractor shall use this standardized convention for all deliverables associated with the work assignment(s).

The Contractor shall immediately notify the EPA WAM by telephone of any problems that may impede performance, along with any corrective actions needed to solve the problems. Any agreed plan should be documented in writing and submitted within 48 hours.

Task 1 - Deliverables:

Deliverable	Due Date
1.1 - Work plan, with QA and budget:	Within 21 days of receipt of work assignment
1.2 - Progress/budget reports:	Included in the Monthly Technical and Cost Progress Report
1.3 - Problem report:	Contractor shall notify the EPA WAM immediately upon discovery of a problem.

Task 2: Fieldwork Support

The Contractor shall provide shore-side and/or onboard technician(s), as necessary and in accordance with the final survey plan, who possess specialized skills that allow them to support EPA scientists in data or sample collection.

For the South Oahu site, the Contractor shall provide services to include the following:

1. Sediment profile imaging and plan view imaging *[in addition to equipment specifications above in Section 5, contractor must provide two SPI and two plan view camera heads (primary and backup) for this survey, typically available as leased equipment]*;
2. Sediment sampling for chemistry and benthic community analysis; Contractor shall collect a maximum of 25 of sediment samples and a maximum of 25 of benthic samples for each site, and prepare these samples as appropriate for laboratory analysis and benthic community analysis.
3. Multi-beam (high resolution bathymetry – if available on the ship) Contractor shall be responsible for calibration of the multi-beam to ensure collection of high quality data to allow for inspection for unexpected or special features in the survey grid prior to deployment of sampling equipment to the seabed, and post-processing at the end of the survey to create bathymetry and sediment maps (if there is adequate contrast), and;
4. Sub-bottom profiling geophysical survey (dredge material deposit mound/thickness). This survey activity is expected to be conducted on a separate vessel.

For the Hilo site, The Contractor shall provide all of the activities listed for the South Oahu site, with exception of sub-bottom profiling geophysical survey.

Subtask 2.1 - Field Supplies

The Contractor shall provide assistance in shipment and preparation of appropriate field supplies, in support of the field survey tasks.

Subtask 2.2 - Survey Equipment Support

The Contractor shall provide technician(s), as necessary and in accordance with EPA provided final survey plan, who are familiar with and can provide support to EPA scientists in the shipment of, mobilization of, and maintenance of survey equipment, supplies and other expendables, associated with sediment profile imaging (SPI), sediment sampling for chemistry and benthic community analysis, multi-beam (high resolution bathymetry), and sub bottom profiling (dredge material deposit mound / thickness).

Subtask 2.3 – Samples Support

The Contractor shall provide support based on the EPA final survey plan in the preparation of and shipment of samples and data for analysis, including appropriate chain-of-custody procedures.

Task 2 - Deliverables:

Deliverable	Due Date
Subtask 3.1 – Field supplies support deliverables:	June 24, 2013; survey starts on June 25
Subtask 3.2 - Survey equipment support deliverables:	June 24, 2013; survey starts on June 25
Subtask 3.3 –Samples support deliverables:	June 24, 2013; survey starts on June 25

Task 3: Analysis of Collected Data and/or Samples

Subtask 3.1 – Analytical Support

The Contractor shall provide analytical support for samples and data collected by sediment profile imaging (SPI) and plan view imaging (for approximately 100 stations), sediment sampling for chemistry and benthic community analysis (for approximately 50 stations), multi-beam (high resolution bathymetry), and sub bottom profiling (dredge material deposit mound / thickness), including: sediment physical and chemical analysis, interpretation of SPI images, analysis and interpretation of bathymetry and sub-bottom data, and benthic taxonomy and community analysis.

Subtask 3.2 – Raw Data Delivery

The Contractor shall provide raw data in appropriate EPA-compatible electronic (digital) format, and provide statistical worksheet and output files.

Task 3 - Deliverables:

Deliverable	Due Date
Subtask 3.1a –Analytical support deliverables: Sediment profile images; plan view images; multi-beam data; sub-bottom profile data; sediment chemistry	60 days or by direction from WAM
Subtask 3.1b – Analytical support deliverable: Benthic community samples (including: sorting, IDs, statistics)	120 days or by direction from WAM
Subtask 3.2a - Data delivery support deliverables: Sediment profile images; plan view images; multi-beam data; sub-bottom profile data; sediment chemistry	120 days or by direction from WAM
Subtask 3.2b – Data delivery support deliverables: Benthic community data	180 days or by direction from WAM

Task 4: Data Management and Sample Archives

Subtask 4.1 – Managing and Archiving Data Support

The Contractor shall provide support in managing and archiving data after completion of surveys, including utilization of appropriate (1) backup media and placement into (2) appropriate EPA-supported format(s).

Subtask 4.2 – Sample Preparation, Transport and Storage Support

The Contractor shall provide support with sample preparation, transport, and storage, including appropriate chain-of-custody procedures and voucher archives of benthic samples (i.e., identified species).

Task 4 - Deliverables:

Deliverable	Due Date
Subtask 4.1 – Managing and archiving data support deliverables:	180 days or by direction from WAM
Subtask 4.2 - Sample preparation, transport and storage support deliverables:	7 days (transfer to alcohol); 180 days (delivery of voucher samples), or by direction from WAM

Task 5: Support in Preparation of Reports

The Contractor shall provide support, as necessary, in data analysis which EPA scientists can use for internal briefings, preparation of reports, and publications outside of the agency. The Contractor shall provide map, graphic, data and report files in appropriate EPA-compatible electronic (digital) format as described in Section 5 in section 4.4.

Task 5 - Deliverables:

Deliverable	Due Date
Subtask 6 – Reports preparation support deliverables:	180 days or by direction from WAM

7. Survey Platform Information

Ship time on the primary oceanographic vessel (provided by NOAA) is covered by separate procurement (Interagency Agreement between EPA and NOAA).

Sub-bottom profiling geophysical survey work is expected to be conducted on a separate, specially-equipped vessel (under this work assignment).

8. General Work Assignment Requirements:

- A. Confidential Business Information: The Contractor will, at all times, adhere to Confidential Business Information (CBI) procedures, including those requirements listed at 40 CFR Part 2, when handling industry information that the EPA Work Assignment Manager (WAM) identifies as CBI. When noted as necessary by the EPA WAM, the Contractor will manage specified reports, documents, and other materials, as well as specified draft documents developed under this WA in accordance with the procedures set forth in its “Security Plan for Handling Confidential Business Information Under the Clean Water Act (CWA),” dated March 5, 2004 or its successor approved plans.
- B. Identification as Contracting Staff: To avoid the perception that Contractor personnel are EPA employees, Contractor personnel shall be clearly identified as independent Contractors of EPA when participating in events with outside parties and visiting field sites. When speaking with the public the Contractor should refer all interpretations of policy to the EPA WAM.
- C. Limitation of Contractor Activities: The Contractor shall submit drafts of all deliverables to the EPA WAM and alternate EPA WAM for review. The Contractor shall incorporate all EPA WAM comments into the final deliverables, unless otherwise

agreed upon by the EPA WAM. The Contractor shall adhere to all applicable EPA management control procedures as implemented by the EPA Contracting Officer (CO), Project Officer (PO), and WAM.

- D. Compliance with Section 508 Requirements: Section 508 of the Rehabilitation Act mandates that all Federal departments and agencies make electronic and information technology accessible to individuals with disabilities. This includes all individuals with disabilities wishing to access Federal information. EPA is committed to making every possible effort to ensure that all electronic and information technology developed, procured, maintained, or used by EPA is accessible to all persons with disabilities. Consequently, according to the contract clause “EPAAR 1552.2119-79: Compliance with EPA Policies for Information Resources Management,” all deliverables submitted by the Contractor shall be compliant with the Section 508 requirements.
- E. Travel: Travel for up to four contractor or sub-contractor personnel to the home port of the NOAA vessel is expected and necessary in support of this WA, including airline travel, at a minimum, for any personnel not located on Oahu. As such, any travel authorization must be submitted to and approved by the EPA WAM and the EPA Project Officer prior to the travel taking place. All travel shall be in accordance with FAR 31.205-46.
- F. Draft and Deliverable format: All memos, draft comments, summaries and responses are to be provided electronically in Microsoft Word and/or Excel. The Contractor shall clearly specify the methods, procedures, considerations, assumptions, relevant citations, data sources and data that support their conclusions. EPA will review all outputs in draft form, and the Contractor shall incorporate the changes specified by EPA prior to providing a final version. All final materials, e.g., memos, tables, spreadsheets, etc. are to be prepared only after incorporating comments on draft documents provided by the EPA WAM.

Attachments:

The following are additional documents and information pertaining to this work assignment. They are:

1. Sediment Profile Imaging – General Field Sampling and Analysis Specifications
2. General Example of Benthic Analysis Protocol
3. Example Survey Layout for Multi-beam and Sub-bottom Profiling
4. Hilo ODMDS - General Location Maps
5. Hilo ODMDS-Tentative Sampling Locations
6. South Oahu ODMDS - General Location Maps
7. South Oahu ODMDS - Tentative Sampling Locations

Attachment #1a - Sediment Profile Imaging – General Field Sampling and Analysis Specifications

1. Field Survey Details – minimum requirements
 - Approx 50 sampling stations per site (see attached maps – survey grid)
 - Minimum of 3 photographs per station; maximum of 5 photographs
2. Analysis Details – minimum requirements
 - Redox potential discontinuity (RPD)
 - Successional stage determination
 - Dredged material thickness

Sediment Sampling – General Chemistry and Benthic Community Specifications

1. Field Survey Details – minimum requirements
 - Approx 20-25 sampling stations per site (see attached maps – survey grid)
 - Grain size subsample
 - Metals subsample
 - Organics subsample
 - Special analysis subsamples (i.e., Dioxins, Tributyltins)
2. Analysis Details – minimum requirements
 - Sediment parameters (others to be analyzed by EPA lab)
 - o Grain size
 - o PCB congeners
 - o Butyltins
 - o Dioxins
 - Benthic community (see attachment – example of analysis protocol)
 - o Sample processing – in field and in lab
 - o Sorting
 - o Taxonomic ID to species
 - o Enumeration of ID'ed organisms
 - o Statistics
 - o Voucher samples

Attachment #1b

**Examples of Sediment
Profile Images**

SPI photograph
showing multiple
layers of dredged
material
undisturbed bottom.

Dredged Material Layers
Overlying Native Sediments



Native Sediments

An SPI photograph
from a healthy,
undisturbed mud
bottom showing a sub-
surface feeding void
from a community of
deposit-feeding marine
worms.

Attachment #1c

Example of Plan View Image



Attachment #2 - General Example of Benthic Analysis Protocol

Sorting, Identification, and Enumeration

Sample Sorting Laboratory Procedures: A sample designated for sorting will be stained in a saturated alcoholic solution of Rose Bengal at least overnight, but no longer than 48 hours to avoid over-staining. The ethanol the samples have been stored in will be poured through a 0.3 mm sieve. The ethanol will be saved to re-preserve the sample residue once sorting is completed. The remaining portion of the sample will be gently elutriated by adding tap water to the sample container and allowing the water to run over the edge, carrying lighter organisms with it. Once the water running off the container is clear, the sediment collected on the sieve will be gently washed into Petri dishes for sorting. This procedure will be repeated, gently swirling the container each time, until only the consolidated particles remain. These will be washed directly on to the sieve and broken up with a gentle spray of water. Sieves will be examined after the transfer to ensure that no organisms remain entangled in the mesh.

Each dish of washed sediment will be sorted using a dissecting microscope. Only a thin layer of sediment will be present in each dish and a low level of liquid to prevent splashing as the dish is moved during sorting. Sorted organisms, including fragments, will be sorted into glass vials and preserved in 80% ethanol. All vials will have internal labels with the year, station, and taxon name (major group or family where possible). Once an entire sample has been sorted, the vials for the station will be bundled together and stored until the taxonomists begin their identifications. The sample residue that remains after sorting will be transferred back to the sample container and re-preserved in an 80% ethanol solution. A batch list of all sorted samples will be kept for each sorter.

Sample Sorting QA/QC: Following sorting completion of ten samples by a sorter, a senior technician will check at least 10% of the samples sorted by each technician to detect any unacceptable sorting errors. For each batch of ten samples written on the batch list, one random sample from each batch will be selected and fully resorted. At least 95% of all animals must be removed from a sample to pass the QC evaluation (i.e., the percent sorting error must be $\leq 5\%$).

If a sample fails the QC evaluation, all remaining samples from that batch of samples will be resorted. In addition, technicians will be informed of any necessary corrective measures. A second random sample from the batch will be checked by a senior technician to confirm that at least 95% accuracy was achieved. This procedure will be repeated until the batch of samples passes the QC evaluation. A record of all sorting QC evaluations will be maintained for each technician.

Identification and Enumeration Laboratory Procedures: In general, identification of all specimens will be to the species level whenever possible. It is often not possible to identify juveniles and damaged or incomplete specimens to a species level but an attempt will be made to identify such specimens to a generic or family level. Only specimens with a critical body part will be counted (polychaetes, arthropods – head; bivalve – umbo; etc). Fragments will be retained in a separate vial but will not be counted. Current keys and primary literature will be used whenever possible to aid with identification. When difficult or problematic taxa are encountered, outside taxonomic experts may be consulted to help resolve identifications.

Specimens from each vial will be rinsed into separate Petri dishes. All vials will be visually inspected to ensure that all organisms have been rinsed from the vials. Each taxon will be identified, counted, and put into separate vials. All vials will be labeled internally with the project name, station number, and taxon name. All vials from each sample will be pooled together into one container.

All identifications will be performed using dissecting and compound microscopes. Each taxonomist will have designated taxa that they are responsible for identifying. Each taxonomist will have a raw datasheet with columns for taxon name, count, and comments. The station number will be clearly indicated on each datasheet. All records on the species abundance data sheets will be made in ink. When the data is ready for submission, the taxonomist will sign and date the datasheet and submit it to the Database Task Manager.

Identification and Enumeration QA/QC: The same basic QC principles described for sample sorting applies to species identifications. For example, at least 10% of the samples will be checked to detect any unacceptable identification and enumeration errors. Due to the use of taxa-specific specialists for this project, these checks will be performed by the same taxonomists as did the original identification. In addition, the same 95% percent accuracy level will be used to determine if a sample passes the QC evaluation and the same corrective measures will be implemented if a sample fails. Please note that in certain cases it may not be necessary to reprocess the entire batch of samples if only minor corrections are needed (e.g., name changes). When any misidentification is discovered, all previously identified samples containing that taxon will be rechecked. A record of all identification QC evaluations will be maintained.

Development of a voucher collection taken from species identified from benthic samples collected from the South Oahu and Hilo sites:

A representative voucher collection of taxa identified in the samples will be prepared from scratch. Each taxonomist will designate an appropriate representative specimen(s) of each taxon they identify. This material will be transferred to the Voucher Task Manager following the resolution of all identification issues. In the case of rare taxa where there is only a single occurrence, no voucher will be provided. A voucher for taxa identified to only the family level or higher will also not to be included in the collection. Each vial will be labeled with the following: 1) project year; 2) station number; 3) taxon name; 4) specimen count; and 5) taxonomist and their affiliation that performed the identification. Vials will be organized according to Class, Order, or higher level as needed in boxes holding up to 144 vials. A database containing the 1) project year; 2) station number; 3) taxon name; 4) specimen count; 5) taxonomist and their affiliation that performed the identification; and 6) storage box containing the vial will be provided as part of the deliverable.

Vials will be shipped to EPA according to current Department of Transportation (DOT) and International Air Transport Association (IATA) regulations for the transportation of hazardous materials.

Prepare Draft and Final Report based on samples collected Database Management:

Completed datasheets will be entered into an excel database formatted specifically for this project once they are received by the Database Manager. During data entry, the consistency of names being used by the taxonomists as well as potential anomalies in the data requiring further review by the taxonomist will be identified. Any changes will

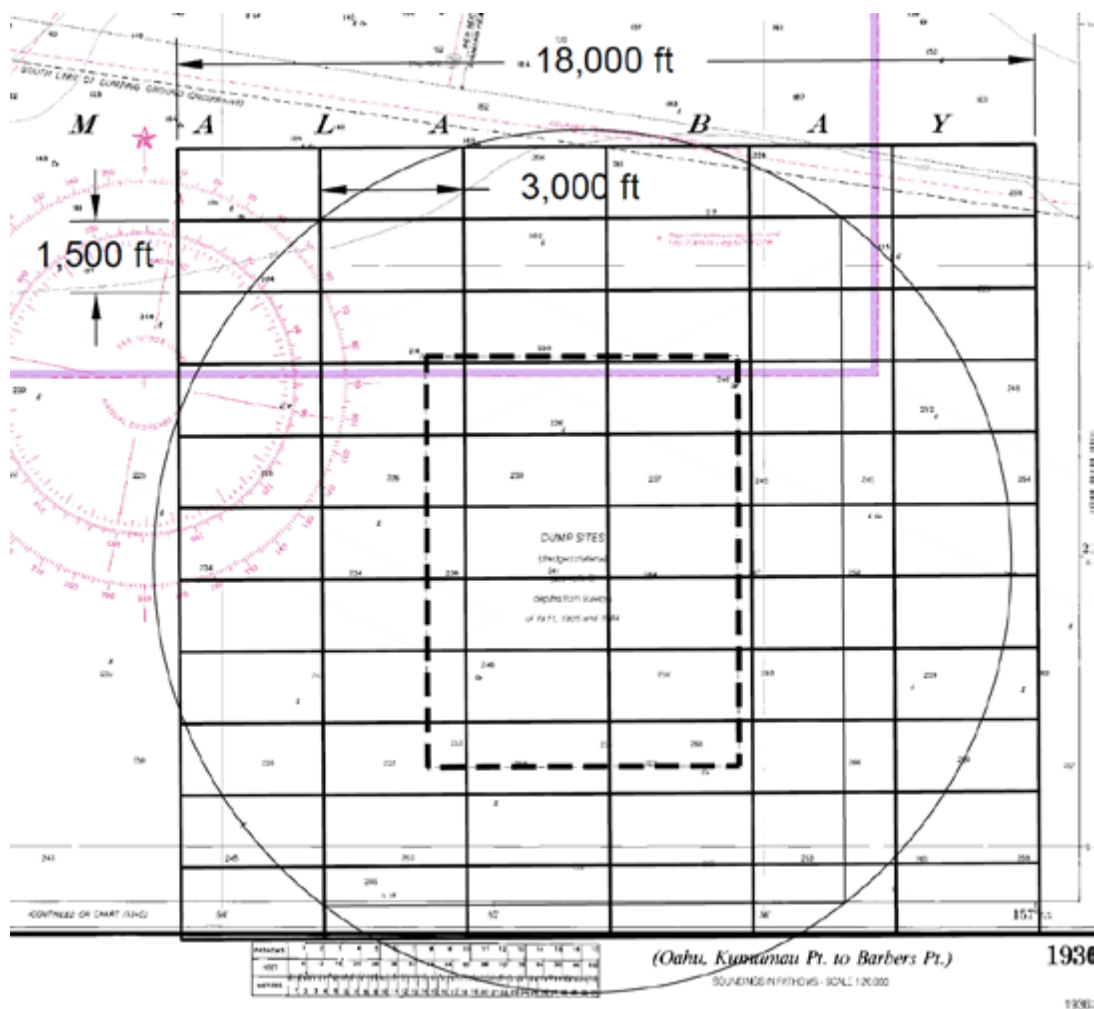
be noted on the original datasheets and the database updated. The resulting database will be 100% crosschecked against the raw datasheets.

As part of database management, the consistency of names used by taxonomists will be reviewed as well as species abundances. There will also be a review of names used in the prior analyses to ensure that any literature published in the intervening years that might affect the accuracy of the species list is incorporated. Any anomalies requiring further investigation by the taxonomists will also be identified. Taxa that will be included in abundance counts but excluded from multivariate statistics will also be identified and flagged in the database.

Data analysis and Reporting The report will include summary statistics on species richness, diversity, and density of the fauna. Multivariate statistics will be used to define patterns in the community structure that might suggest natural depth related trends or potential impacts from the disposal of dredged material. Other information available in other benthic reports or papers, including sediment, chemistry, and sediment profile imagery, will be considered, as appropriate, for any (limited) retrospective comparison in order to assess patterns in benthic community parameters and community structure.

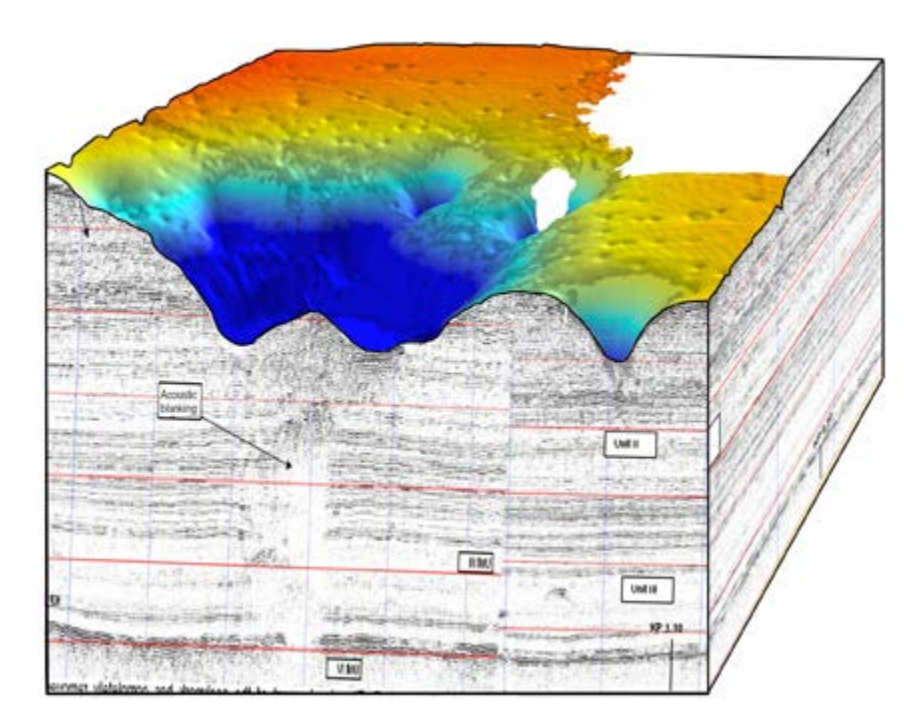
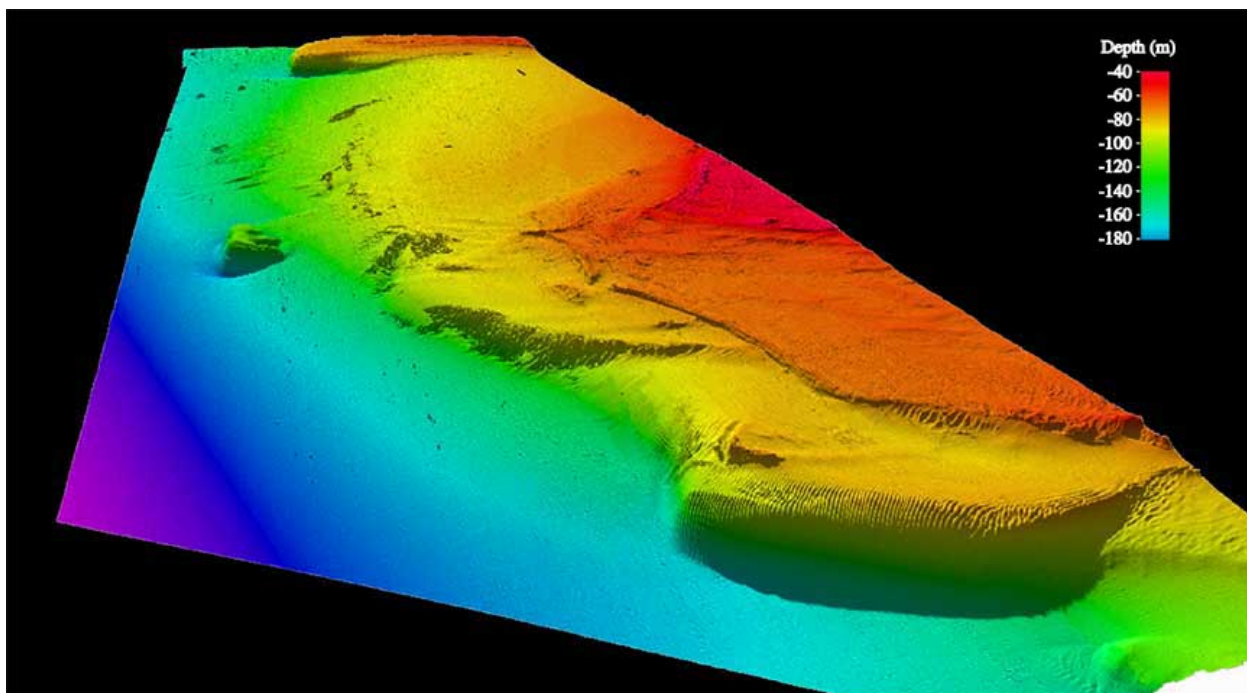
Attachment #3a - Example Survey Layout for Multi-beam and Sub-bottom Profiling

A survey grid centered over the South Oahu ODMDS was expanded to approximately 3 nautical miles by 2.75 nautical miles. East-West survey lines are at a spacing of 1,500 ft, and North-South survey lines are at a spacing of 3,000 ft. Approximate total survey line distance is 55 nautical miles. The survey layout is shown in figure below.



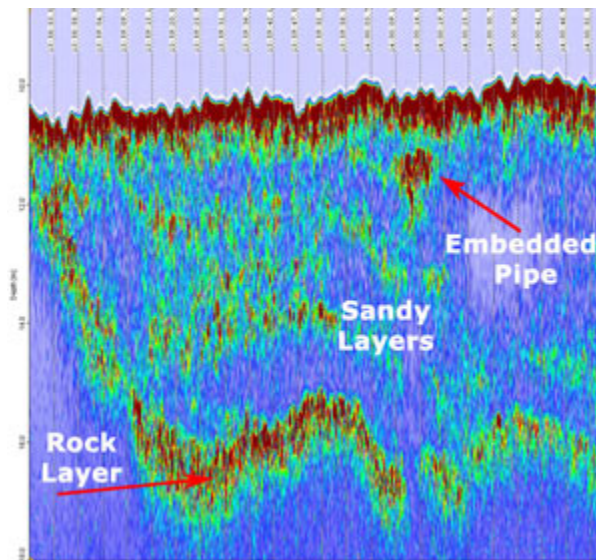
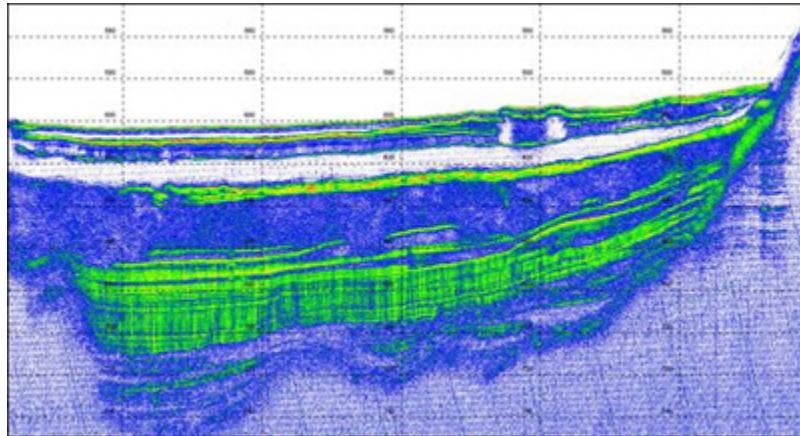
Attachment #3b

Examples of Multi-Beam Profiles



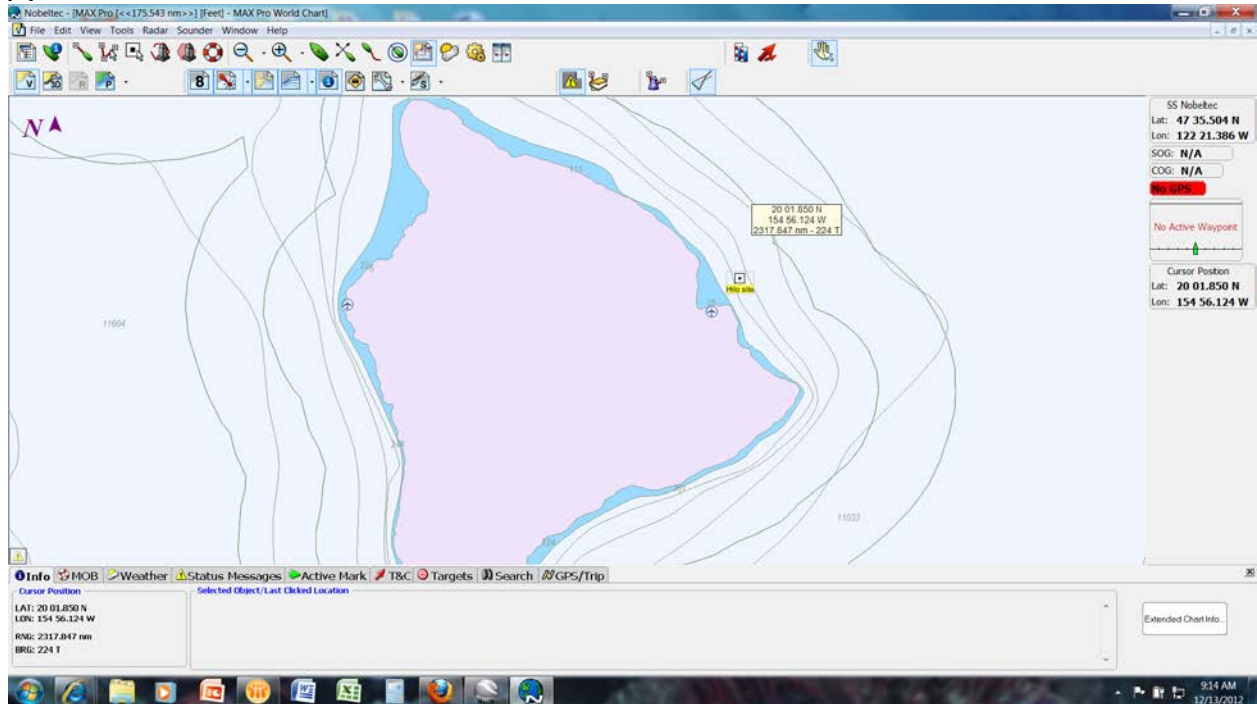
Attachment #3c

Examples of Sub-Bottom Profiles

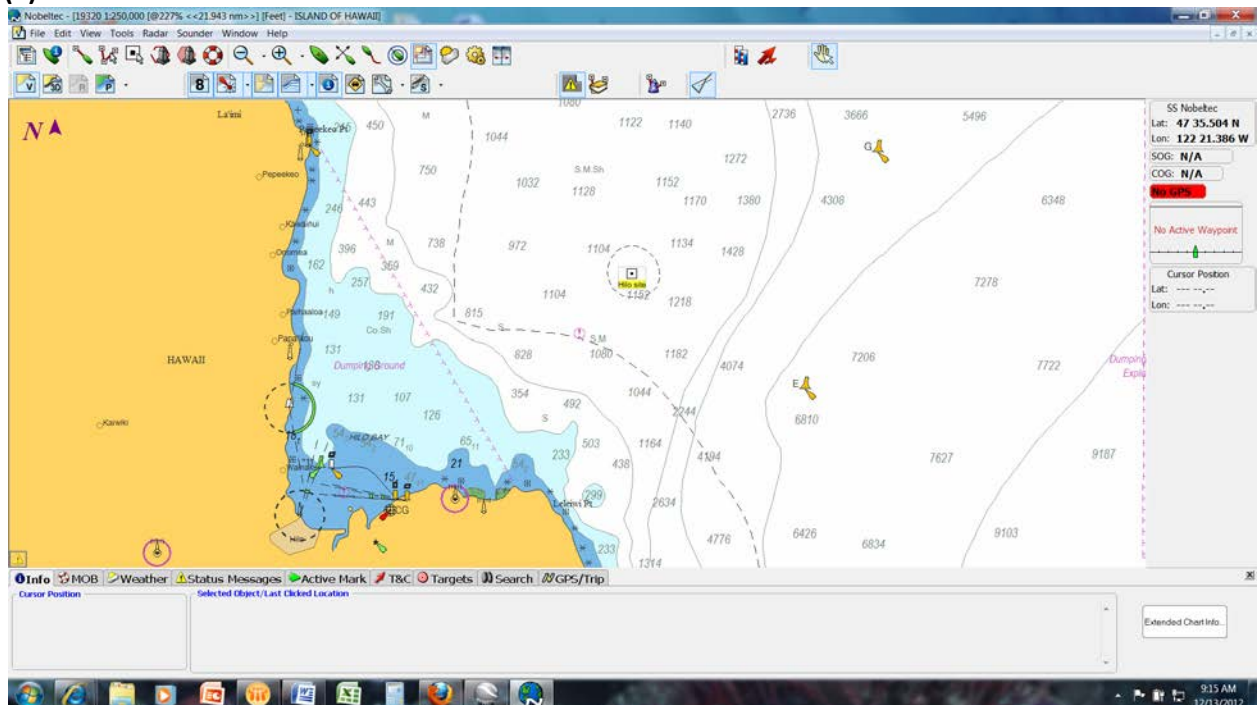


Attachment #4 - Hilo ODMS - General Location Maps

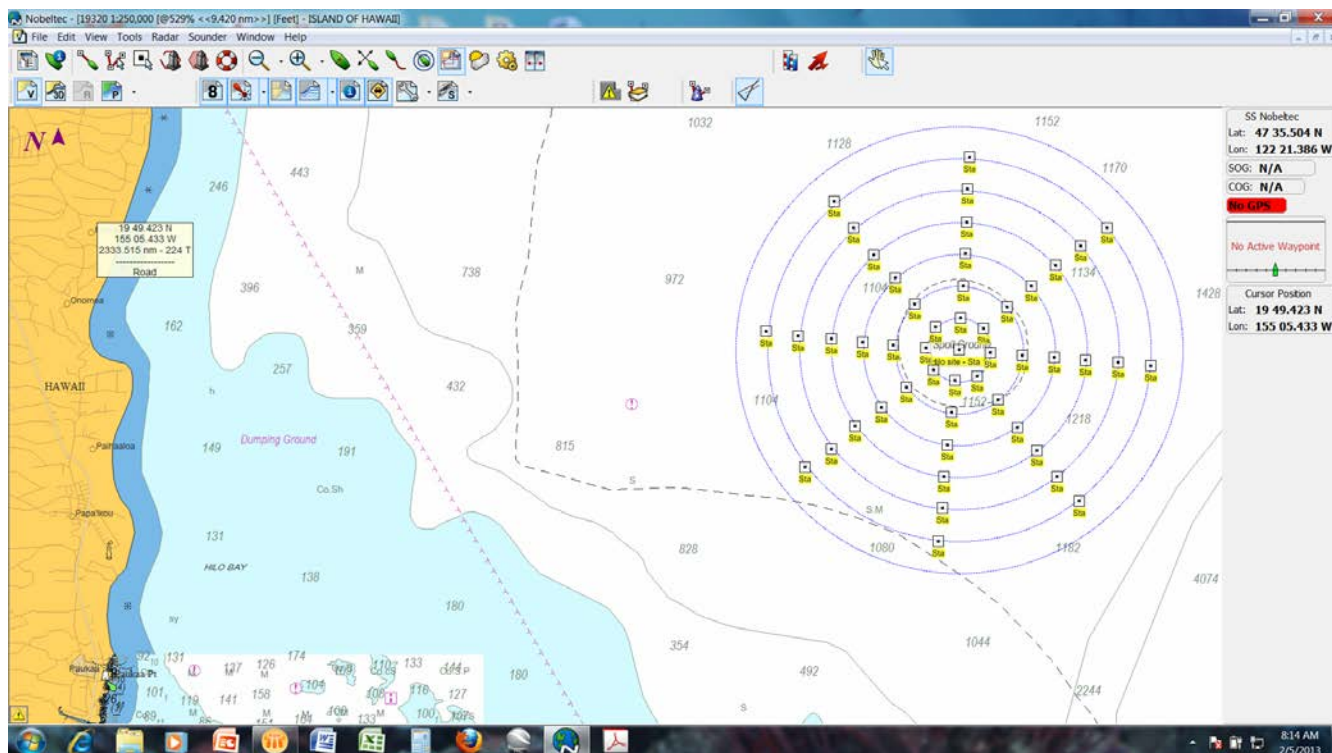
(1)



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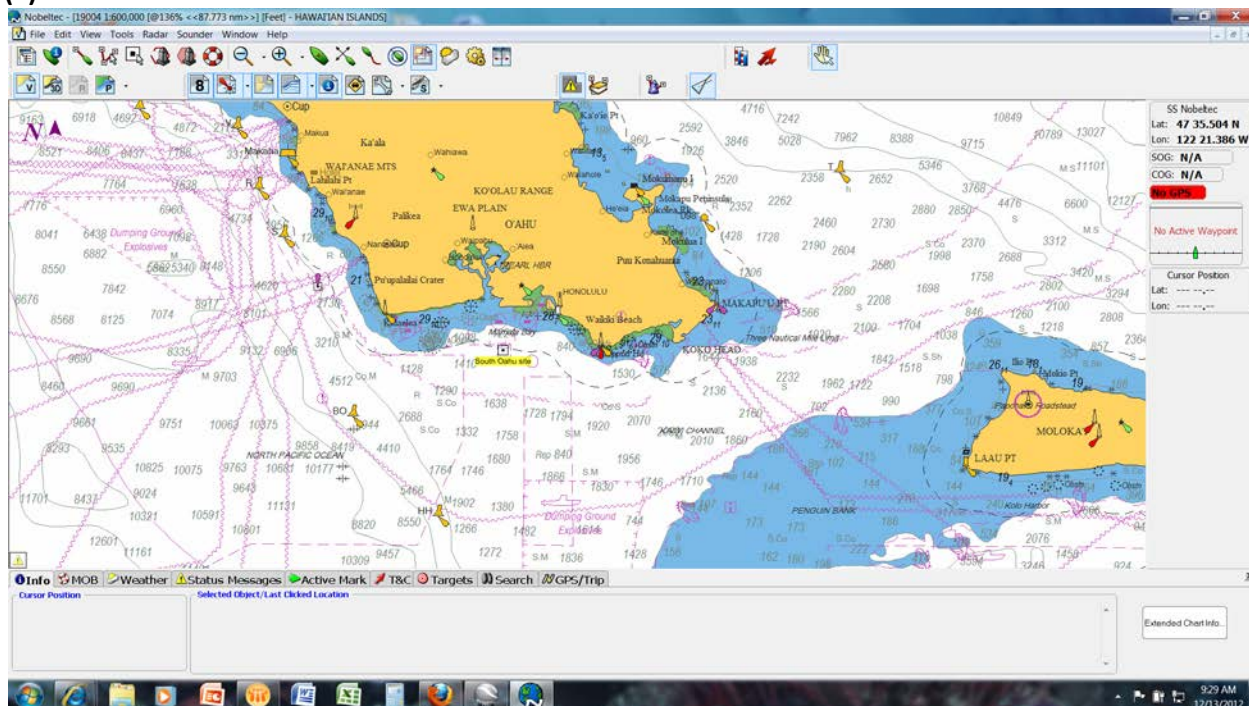


Attachment #5 - Hilo ODMS - Tentative Sampling Locations

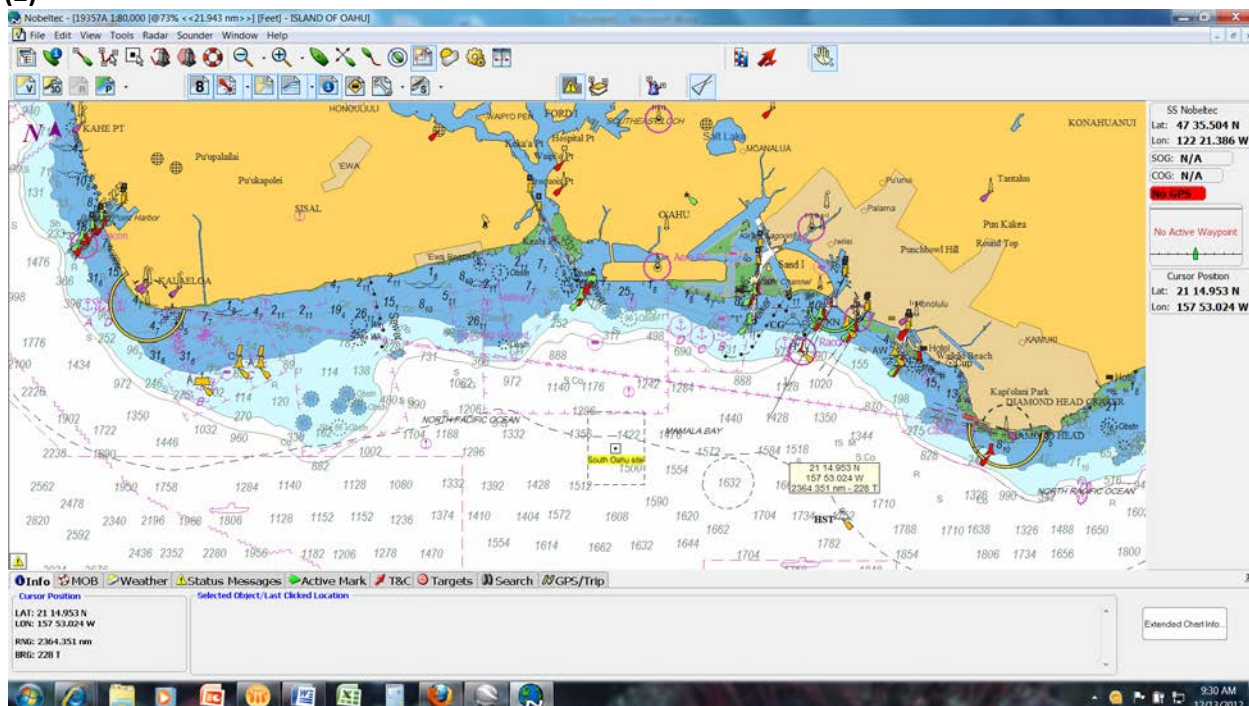


Attachment #6 - South Oahu ODMDS - General Location Maps

(1)



(2)



Attachment #7 – South Oahu ODMS - Tentative Sampling Locations

